

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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TABLE NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

PDS0101 –INTRODUCTION TO DIGITAL SYSTEMS

(All sections / Groups)

13 OCTOBER 2018

9.00 a.m. – 11.00 a.m.

(2 HOURS)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 11 pages (including this page).
2. Answer ALL FIVE questions.
3. Please **WRITE ALL YOUR ANSWERS IN THE QUESTION PAPER ITSELF** in the space allocated.

Question 1

- (a) Explain how bits are transferred from source to destination if it is
- (i) Serial transfer
 - (ii) Parallel transfer

[1+1 marks]

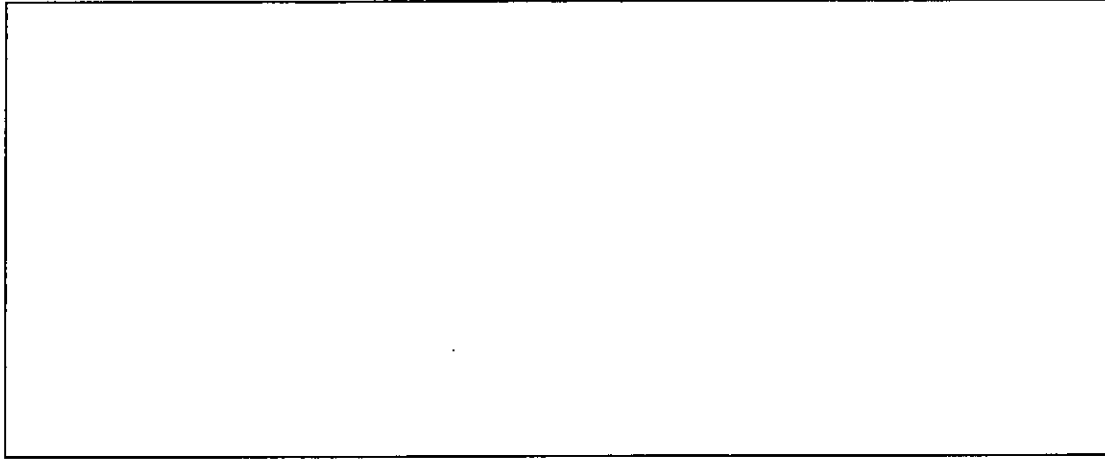
- (b) Company A needs to design a device that is capable to transfer 3Kbyte, and the time to transfer a bit is 0.1 second (s).
- (i) Calculate its frequency (Hz).
 - (ii) Explain the meaning of frequency based on (i)
 - (iii) Identify the size of data in bits [Hint: Kilo = 10^3 ; 1 byte = 8 bits]
 - (iv) Calculate the time needed to serial transfer all data in second (s).

[1+1+1+1 marks]

Continued...

(c) Perform $(26)_{10} - (6)_{10}$ by having addition in 8-bit 2's complement. Show all steps.

[4 marks]



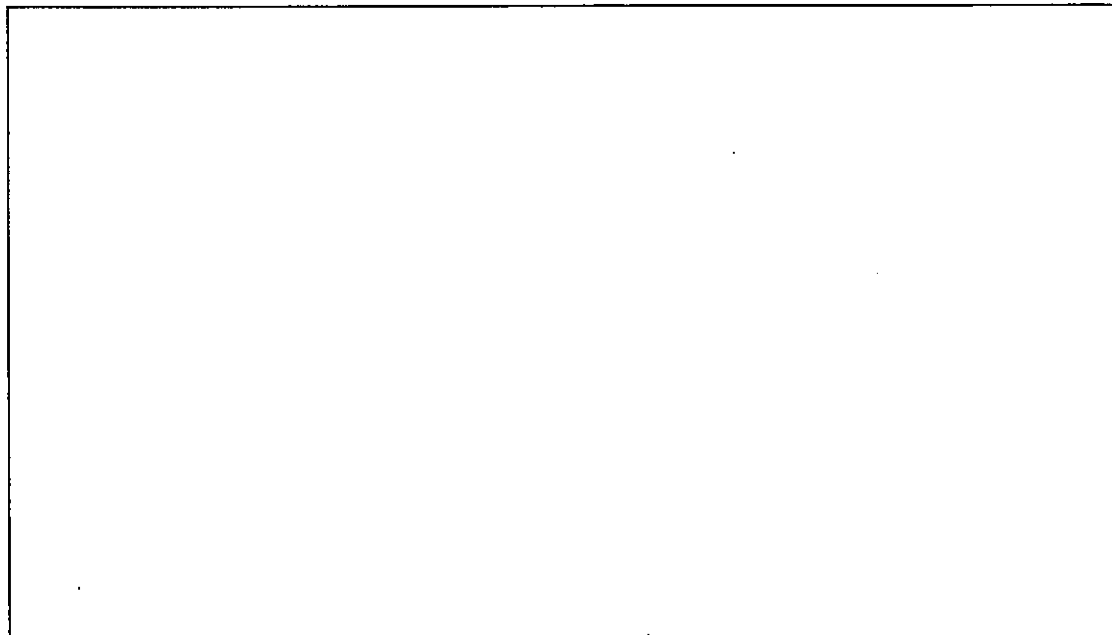
Question 2

(a) Given the memory address of $E5F9_{16}$, what is its content in:

- (i) Binary
- (ii) Octal

Show all steps.

[1+1 marks]



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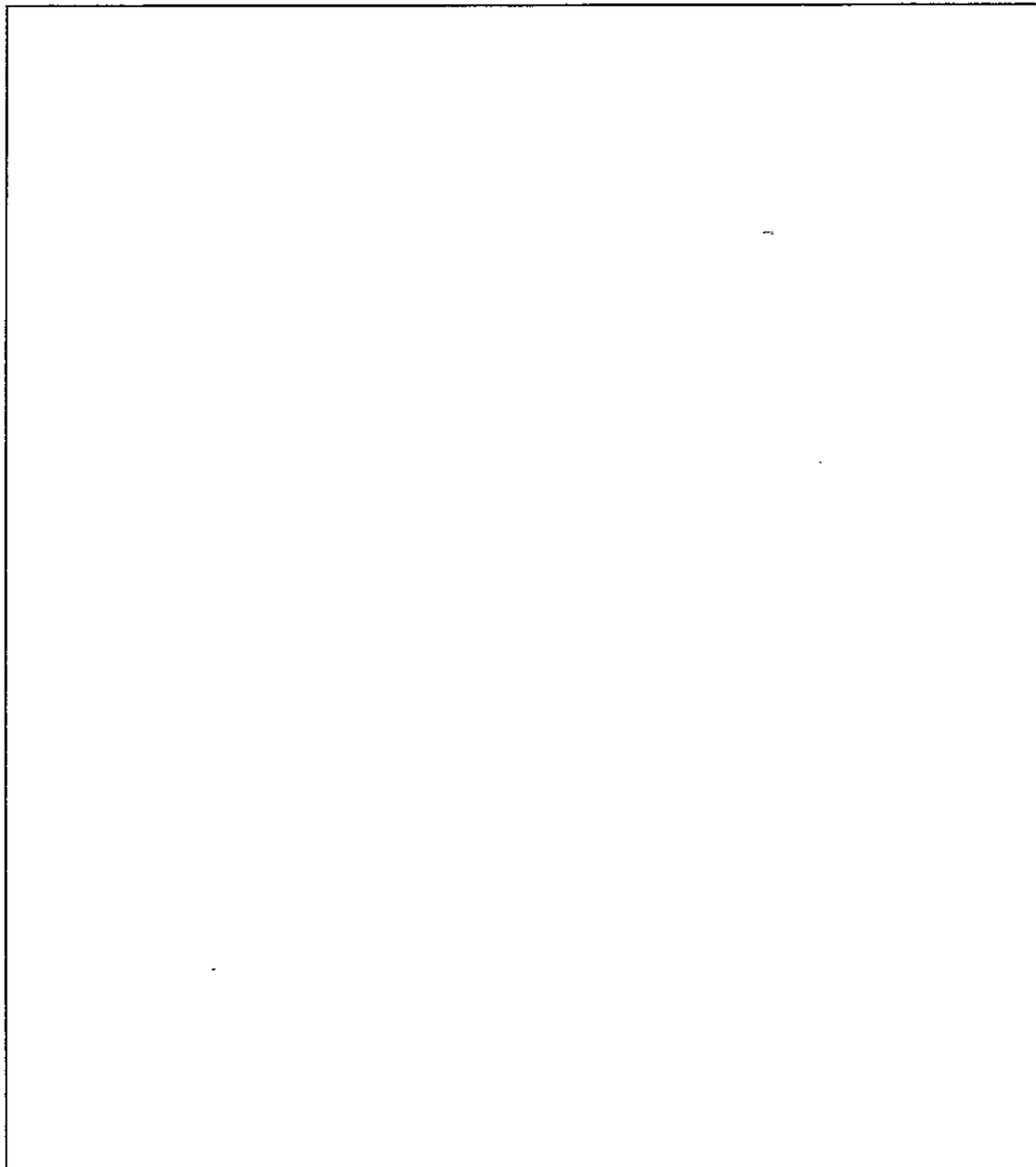
- (b) For the $F(x,y,z) = (x + y)' (x' + y' + z')$:
- (i) Draw the logic diagram of the given function F .
 - (ii) Simplify the function F to a minimum number of literals using Boolean Algebra.
 - (iii) Prove that the function F and its simplified as in (ii) are the same using truth table.
 - (iv) Give one reason on why simplification is important in designing logic circuit.
- [2+2+2+2 marks]

Continued...

Question 3

- (a) Given the function $F(x,y) = (x' + y)(x + y)$
- (i) For each sum term, obtain its binary value.
 - (ii) Obtain the function $F(x,y)$ using only NOR gates.
 - (iii) Draw the logic circuit using only NOR gates as expressed in (i)

[1+1+2 marks]



Continued...

- (a) Design a Base-5 number system detector, whereby the valid Base-5 numbers are 0, 1, 2, 3, and 4. The combinational logic circuit contains three inputs (x,y,z) and one output (out), whereby the output is 1 if it is a valid Base-5 number system, otherwise 0.
- (i) Obtain its truth table
- (ii) Obtain its simplified Boolean function in SOP form using K-Map
- (iii) Draw the logic circuit based on the simplified Boolean function as in (ii)

[2+2+2 marks]

(i)	x	y	z	out
	0	0	0	
	0	0	1	
	0	1	0	
	0	1	1	
	1	0	0	
	1	0	1	
	1	1	0	
	1	1	1	

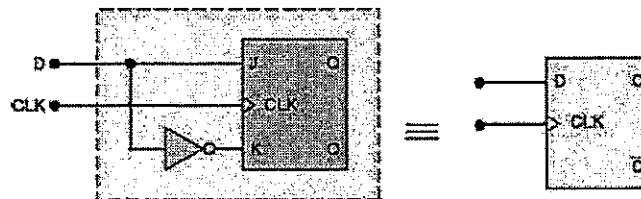
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Question 4

- (a) Explain decoder and give one example on the usage of decoder.

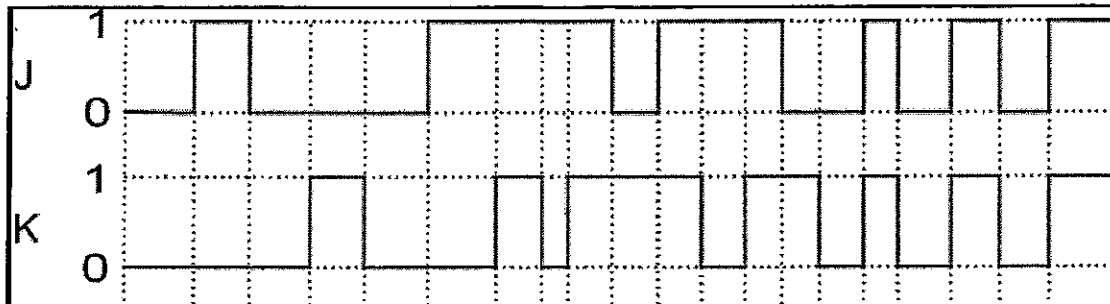
[2 Marks]

- (b) As can be seen in below diagram, prove that clocked J-K flip-flop can be used to substitute clocked D flip-flop. Use truth table. [3 marks]



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(c) Given the below diagram, determine the output Q for each J-K inputs. Assume the flip-flop is initially RESET. [3 marks]



(d) Why is clock signal is important to digital circuit and what are the two types of clock signal? [2 marks]

Continued...

Question 5

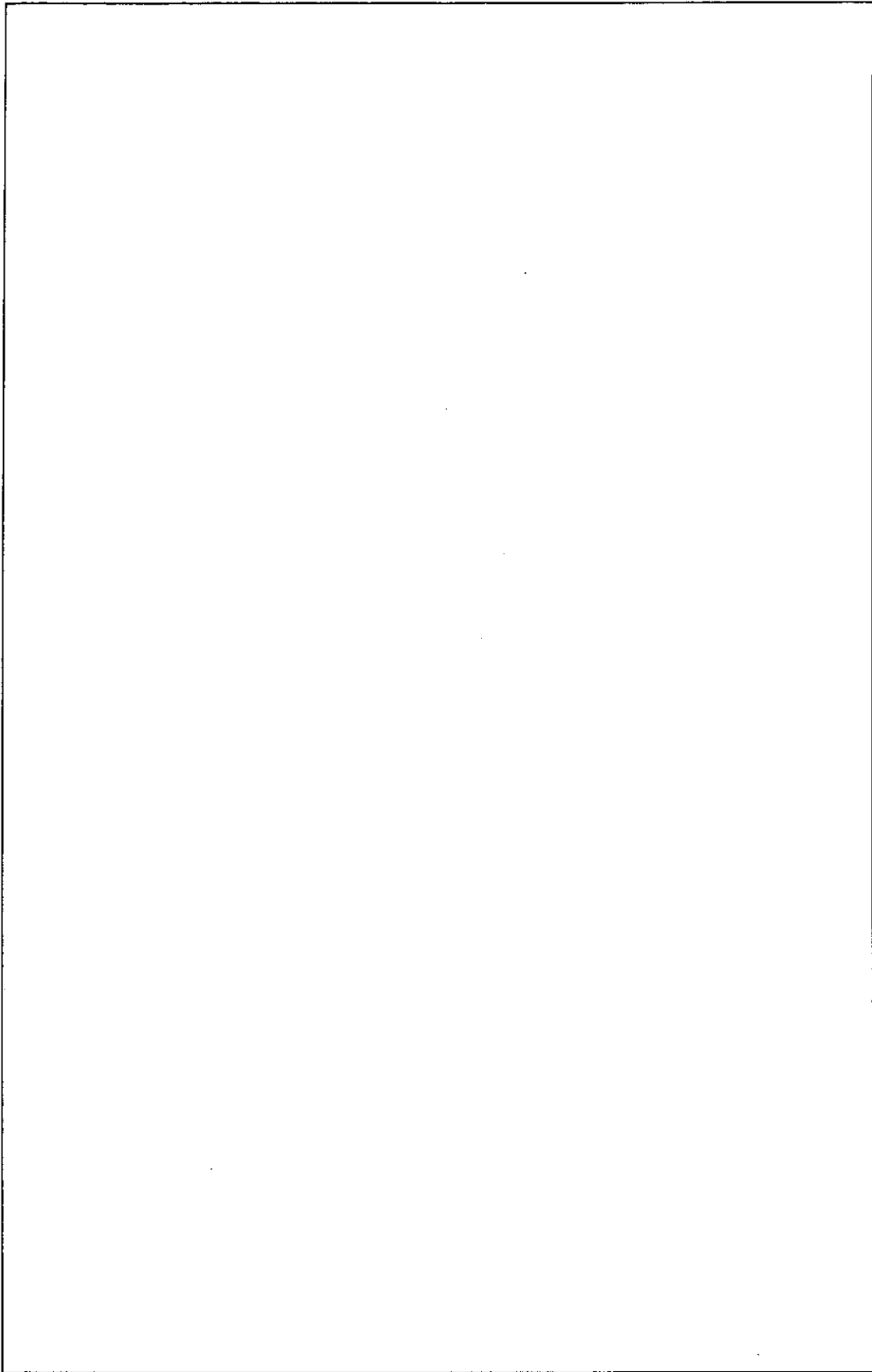
- (a) Design a **3-bit synchronous counter** using **J-K flip-flops** that produce the following sequence: **000, 001, 010, 110 and repeat**. The undesired states must always go to DON'T CARE on the NEXT clock pulse. Your design should include
- State transition diagram showing all possible states,
 - Circuit excitation table for $J_C, J_B, J_A, K_C, K_B, K_A$ using Present States and Next States
 - Karnaugh Map simplification for each of $J_C, J_B, J_A, K_C, K_B, K_A$ inputs.
 - Draw the 3-bit synchronous counter using J-K flip-flops.

[1+2+3+2 marks]

(ii)

C	B	A	C_N	B_N	A_N	J_C	K_C	J_B	K_B	J_A	K_A
0	0	0									
0	0	1									
0	1	0									
0	1	1									
1	0	0									
1	0	1									
1	1	0									
1	1	1									

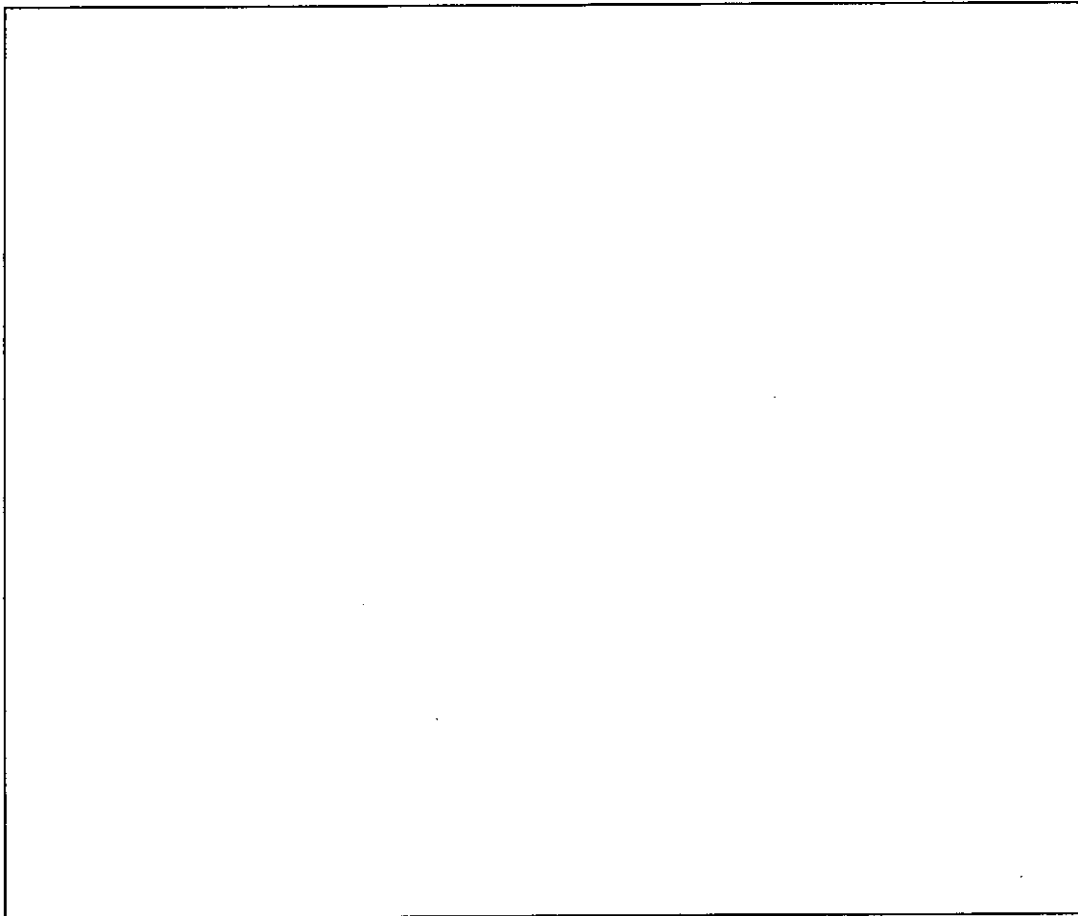
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(b) Draw a 4-bit serial-in parallel-out block register.

[2 marks]



End of Paper